

^{148}Gd PRODUCTION CROSS SECTION MEASUREMENTS FOR ACCELERATOR TARGET FACILITIES

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In a series of experiments at LANSCE’s WNR facility, ^{148}Gd production was measured for 600- and 800-MeV protons on tungsten, tantalum, and gold. These experiments used 3 mm thin W, Ta, and Au foils and 10 mm thin Al activation foils. Spallation yields were determined for many short-lived and long-lived spallation products with these foils using gamma and alpha spectroscopy.

The production of ^{148}Gd by 800-MeV protons on thick tungsten targets is of great importance to spallation neutron facilities at LANSCE (WNR’s target 4 and MLNSC’s target 1), because of the limits placed by DOE on the acceptable ^{148}Gd inventory allowed in the target before requiring the facility to be defined as a “nuclear facility.” Allowed isotopic inventories are particularly low for this isotope because it is an alpha-particle emitter. The activity level of ^{148}Gd is small, but it encompasses almost two-thirds of the total dose burden in the LANSCE facilities based on present yield estimates.

The upper tungsten target at the Lujan Center and Target 4 at WNR are both approximately 7 cm in length. An 800-MeV proton loses approximately 200 MeV energy in passing through these targets, thus exiting with an energy of approximately 600 MeV. Given that DOE limits the amount of ^{148}Gd production, a better understanding of the true production rate in tungsten targets was needed. This is the motivation for measuring the cross section at 600 and 800 MeV. The measured cross sections are compared with the LANL codes MCNPX and CEM2k+GEM2.